The former figure is in some respects better than Scoresby's, as to form and proportions; but a most singular treatment has evidently been accorded it. The elements of the figure have been transposed, and the belly made to serve the purpose of back, and *vice versa*. It is evident that the figure was copied from a real model, as the baleen is shown correctly, though it projects in one place outside the mouth.

The remaining point relates to the authorship of the volume on whales in the 'Naturalists' library.' The portion of the titlepage of our edition relating to this point reads as follows: "Mammalia — whales, etc. By Robt. Hamilton, Esq., M.D., F.R.S.E., etc."

We now desire to ask our critic how much remains to justify the serious charges which he has caused to be distributed wide-cast over the scientific world, to more or less inevitable damage to institution and person. J. B. HOLDER.

If Dr. Holder is satisfied with the way he has met 'the serious charges,' I am quite willing to here rest the matter; failing, as I do, to see that any of them are materially vitiated by his defence, while, amid the obscurity of much irrelevant matter, all of the more important ones are virtually conceded.

In regard to the authorship of the volume on whales in the 'Naturalists' library,' not only have I, as I have said before, examined anonymous copies of the original edition, and found it given as anonymous in bibliographies, but have seen it attributed by contemporary British cetologists to Jardine. The discovery, however, of a copy by Dr. Holder, having Hamilton's name as author on the titlepage, of course settles the question. J. A. ALLEN.

Achenial hairs of Senecio.

Mr. Jos. F. James does not know of any explanation of the use of the threads which are projected from the hairs on the achenia of most species of Senecio, etc. Before calling on SCIENCE to help him, he might read up his text-books, say Gray's Structural botany, p. 306. BOTANICULUS.

Kalmia or rhododendron.

In reply to Dr. Abbott, in SCIENCE for Aug. 17, I will call his attention to the fact that the woods of the kalmia and the rhododendron are quite distinct in appearance, and are not likely to be mistaken the one for the other. The kalmia wood is frequently found in commerce, in the form of handles for tools, such as chisels and the like. The wood is of a very light pink, with darker streaks through it resembling cells filled with woody fibre.

The rhododendron wood is destitute of such marking. As to size, I have seen plenty of the kalmia, four and five inches through the butt, in the mountains of Virginia; and have had in my possession sticks, large enough for any such purpose as the Doctor names, from eastern Pennsylvania. The rhododendron is an extremely rare plant in Chester and Delaware counties, Penn., but the kalmia is common.

S. P. SHARPLES.

Boston, Aug. 22.

THE SOCIETY OF MECHANICAL ENGINEERS.

Transactions of the American society of mechanical engineers. Vol. iii. New York, 1882. 350 p. illustr. 8°.

THIS third volume of the transactions of the youngest of the three great societies of engineers in the United States is a well-printed large octavo of over three hundred pages. It contains a list of the officers and members of the society, its rules, the proceedings of the Philadelphia meeting of 1882, and the proceedings at a memorial session in remembrance of Dr. A. L. Holley, a distinguished engineer and a founder of the society. The proceedings at the latter meeting consisted of an introductory address by president R. H. Thurston, in eulogy of the deceased, and a formal tribute to his memory by Mr. J. C. Bayles, the orator appointed by a committee for the occasion. Many members, as well as the appointed orators, paid earnest and eloquent tribute to the great engineer.

Among the more generally interesting and important papers, are those of Professor Egleston, on the appointment of a government commission to test iron, steel, and other metals; G. W. Bond, on the Pratt & Whitney 'standard gauge system;' Professor Robinson, on the thermodynamics of the Worthington pumping-engine; an essay on the progress of engineering science from 1824 to 1882, by Mr. Fraley of the Franklin institute; the windmill as a prime motor, by Mr. Wolff; and a long paper on the several efficiencies of the steam-engine, by Professor R. H. Thurston.

Professor Egleston gives a history of a movement among the engineers and scientific and business men of the country, to secure the establishment of a permanent commission to determine, by direct investigation, the absolute and relative values of constructive materials in the United States. Under the lead of the Society of civil engineers, such a commission was demanded by a very large number of the leading men of the country, and was created by act of Congress in the year 1875. It consisted of Col. Laidley, Gen. Gilmore, Com. Beardslee, Chief-engineer Smith, Dr. A. L. Holley, and Professor Thurston, the latter acting as secretary. This commission, in the course of two years, working amidst many discouragements, did an enormous amount of work; the results of which are published in a report consisting of two large and fully illustrated volumes recently issued from the government press. The commission was not well sustained. Congress refused to continue its appropriations; and it ceased to exist, despite the protest of all the leading technical societies, polytechnic schools, the principal colleges, and such associations as that of the iron and steel makers. The effort is now making, to revive this commission, and to secure the continuance of its work. The publication of the enormous mass of information acquired by the board during the period of

its short life is hoped to give good argument in favor of prompt and liberal action by another congress, in which, it is believed, there may be a sufficient number of intelligent and patriotic members to carry the measure through without regard to politics.

Mr. Bond describes the method adopted by Professor Rogers of Cambridge, and himself, to secure for Messrs. Pratt & Whitney of Hartford a standard system of exact measures for use in creating a basis for gauges to be used in the United States in general machine construction. The comparator built by the firm, under the advice of these gentlemen, is used. Its readings, with its 'B' microscope, are made from divisions measuring 0.000016 inches. The company has now a set of end measures running by sixteenths to four inches, and a complete plant for making them accurately to within the forty-thousandth of an inch, a magnitude which can be detected by an expert workman.

Professor Robinson gives the theory of the peculiar form of pumping-engine known as the Worthington engine. This is a Wolff form of compound engine in its general arrangement, built without fly-wheel and in pairs, and so constructed that each double engine has its valve-motion operated by the opposite machine. He shows that, theoretically, the 'tandem' type of this combination excels all the other possible adjustments of the engine, in its probable efficiency. The efficiency is not modified perceptibly by the ordinary slight variations of the exponent of the expansion curve. Numerical results of the use of the formulas are given in tabular form. The paper is illustrated by engravings of the several forms and parts of these engines.

Dr. Fraley describes the formation, the growth, and the work of the Franklin institute of the state of Pennsylvania. It was organized in 1824, and has been in active operation ever since. It established the first regular drawing-school in the United States, and has kept it in successful operation for fifty years. It has occasionally given exhibitions of domestic manufactures and products, has gathered together a great library, cabinets of materials, models, and machines, and has for many years regularly published a journal devoted to applied science and the arts.

Mr. Wolff gives the results of investigations of the efficiency and power of windmills, and presents a table, calculated in the course of his studies of the subject, of the relations between the pressure and the velocity of the wind at various temperatures, — the first in which the density and temperature of the atmosphere are taken into account.

Professor Thurston occupies nearly fifty pages in the discussion of the several efficiencies of the steam-engine, including the total commercial efficiency. Expressions are given by which to determine the best proportions of steam-boilers for given costs of boiler and fuel, storage, etc. The best area of heating surface per pound of fuel burned on the grate varies as the square root of the quotient of all annual expenses variable with the cost of fuel, reckoned per pound of coal and per square foot of grate, by the sum of all annual expenses per square foot of heating surface and per square foot of grate, the latter being reckoned only so far as they are dependent on the size of boiler. The efficiency of engine is found to be dependent upon both the ratio of expansion, and the method of variation of waste by internal cylinder condensation with the point of cut-off. Tables are given of the probable best points of cut-off in the various standard types of engines, at various pressures of steam; and also of the probable minimum weights of steam and of good coal required by such engines at various best ratios of expansion.

The 'efficiency of capital' is found to be dependent upon similar quantities, as well as upon the costs of fuel, attendance, operation, etc. The theory of the efficiencies of the ideal engine with non-conducting cylinder is given, and both algebraic and graphical methods of solving problems are presented and illustrated. The theory of the efficiencies of real engines is next treated, and the defects of the Rankine system are remedied. The 'general equation of all steam-engine efficiencies' is given, as deduced by Professor Thurston, and a series of problems falling under the general head are treated by the production of the necessary formulas and by a graphical construction involving the use of his newly discovered 'curve of efficiency.' One-half of the paper is devoted to the solution of various important problems arising in the practice of the engineer and previously unsolved. Tables follow giving the results as applicable to the common forms of steam-engine, and showing the enormous differences in economy and in the best ration of expansion, size of engine, etc., produced by the occurrence of cylinder condensation, a form of waste hitherto untreated by writers on thermodynamics and the theory of the steam-engine. He says, "By the use of this, or some more exact method, the art of proportioning the steam-engine can be elevated to the rank of a branch of the science of

engineering; and that part of the science which has hitherto been in a most unsatisfactory condition, as viewed from the standpoint of the engineer engaged in its application, may be found to take a comparatively complete and useful form.''

GEOLOGY OF PHILADELPHIA.

The geology of Philadelphia: a lecture delivered before the Franklin institute, Jan. 12, 1883. By Professor HENRY CARVILL LEWIS. Philadelphia, 1883. 21 p. 8°.

THE author has distributed his pamphlet edition of this important paper, which deserves extended notice, and has placed him in the front rank of the young prosecutors of original research in the field of geology in this country. This memoir, and his previous lecture on the Ice age in Pennsylvania, have the rare merits that they are solid contributions to our knowledge from the first to the last pages; that they are almost exclusively due to the personal labors of the young geologist who brings them in their very complete form before the world; that they are closely and fairly reasoned out, and lucidly expressed. The great societies of the learned which require for membership the production of a work showing important, new, and original researches, have accepted many essays inferior in all these particulars to the subject of this review. To fully appreciate its merit, one must consider how very vague were the notions of geologists (including the large and growing class of Philadelphia geologists) as to our superficial deposits, before its appearance. The great influence of Louis Agassiz, and his theories of universal glaciation, had restricted the number of those who sought to define the action of glaciers in our continental geology, by extending the limits of this action over the tropics. The explanation of any thing obscure by the words 'glacial action' became almost as common as the explanation of any thing difficult in physiology used to be by the words 'lusus naturae.'

It required, therefore, peculiar independence of thought to break loose from these fictive (always the most insurmountable) fetters, and to see the phenomena with one's own eyes. Besides this, it required laborious journeys, patient note-taking, and attentive reading of what others had done, in order to do justice to the subject, and prepare a monograph upon it. All these Professor Lewis has accomplished; and, though much remains to be done, few presented so complete and neat a view of subject as he has.

It will already appear to be the writer's view, that his matter, and his manner of presenting it, have been found admirable, though as to the latter, his system, while supported by a clear style, will necessarily present some difficulties to the superficial reader. He could either have begun from the exterior and older boundaries of his superficial formations, and have proceeded inwards towards the present river Delaware; or he could have adopted his present plan of commencing in the middle with the red gravel, — inverting somewhat the order of the overlying sediments by considering the alluvium next (which is at the top of all), taking next the Trenton gravel (which underlies the latter), and completing the upper part of the column by treating of the Philadelphia brick clay (which belongs between the upland terrace material, first mentioned, and the Trenton gravel), — and then following the column downward through the red, yellow, and Bryn-Mawr gravels, finishing by a short sketch of the underlying rock formations; or he might have proceeded geographically from the newer deposits on the river, outwards to the Bryn-Mawr terrace.

The writer confesses, that, in view of the perfectly consistent theory which Professor Lewis has evolved, it would seem easier to follow the chronological order of the events which this theory comprehends, even though the geographical sequence were somewhat disturbed; but this criticism does not affect the real value of his results.

Those who read this essay as carefully as it deserves will be rewarded by obtaining a very probable history of this portion of our continent during post-tertiary time, with its submergences and elevations and the consequences thereof. It is perhaps to be regretted that Professor Lewis has not treated with the same care the subordinate part of his subject, to which he devotes a few concluding words; that is to say, the 'gneiss,' the 'auroral limestone,' and the 'triassic sandstone.' Thus, he confounds the views of two masters of our American geology in ascribing the gneiss of Philadelphia in the same breath to the Huronian and the Mont Alban.[1]

It is also somewhat vague to say 'the gneiss of the Rocky Mountains of Colorado;' since there are different gneisses belonging to different ages there, some of them probably Mont Alban, some Huronian, and some very likely Laurentian.

Again: it is conceded by most Philadelphia

[1] Compare Dr. T. Sterry Hunt's view, 2d geol. surv. of Penn., vol. E. p. 200.